

# EXAMINING THE ASSOCIATION BETWEEN LEVELS OF ARSENIC, LEAD AND MERCURY ON NEUROBEHAVIORAL PERFORMANCE AMONG METAL, CHEMICAL AND MINING INDUSTRY WORKERS

Rocío Capelo, *Universidad de Huelva, Spain*  
Diane Rohlman, *Oregon Health & Science University, USA*  
Rosa Galisteo, *Universidad de Huelva, Spain*  
Amanda Gago, *Universidad de Huelva, Spain*  
Jose Andrés Lorca, *Universidad de Huelva, Spain*  
Miguel Ángel García, *Universidad de Huelva, Spain*  
W Kent Anger, *Oregon Health & Science University, Spain*  
Tamara García, *Universidad de Huelva, Spain*  
Jose Luis Gómez-Ariza, *Universidad de Huelva, Spain*  
Juan Alguacil, *Universidad de Huelva, Spain*

**Background:** Diet and working in the chemical, mining and metal industries are important sources of exposure to metals such as lead, mercury and arsenic, which are recognized causes of neurological disorders, among other human diseases. Our objective was to explore the relationship between cumulative exposure of arsenic, lead and mercury and neurobehavioral performance (subclinical effect) in a group of workers exposed to metals, and a group of workers unexposed to metals.

**Methods:** We obtained results of cumulated metal levels in toenails and neurobehavioral test in 56 chemical/metal industry workers and 38 service workers unexposed to metals. A neurobehavioral battery consisting of 14 tests was administered. Multielemental ICP-MS was used to quantify toenails levels of arsenic, lead and mercury. General linear models were used including age, gender, and worker exposure group as covariates, plus the metal levels variable (log transformed toenail levels for each metal separately) to predict each of 14 neurobehavioral outcome variables.

**Results:** We found a suggestion of an association between increased toenails levels of arsenic with a worse performance of the "Tapping with Alternating Hands" test (measures "coordination") ( $p=0.17$ ), and of the "Symbol Digit" test (related with "mental function") ( $p=0.11$ ). Also, a suggestion of worse performance was observed between lead and the "Symbol Digit" test ( $p=0.087$ ), the "Tapping with the Preferred Hand" test (related to "coordination") ( $p=0.17$ ), and the "Digit Span Reverse" test (related with "attention") ( $p=0.126$ ). Mercury levels were associated with a worse performance of the "Simple Reaction Time Total Error" test (related with "response speed") ( $p=0.04$ ), and showed a suggestion of an association with a better performance of the "Continuous Performance False Alarm Latency" test ( $p=0.13$ ).

**Conclusions:** Our results suggest that cumulated exposure to mercury, and to a lesser extend arsenic and lead, are related with poorer neurobehavioral performance among exposed workers.